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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/769,245	01/30/2004	Hsin-Hsien Lu	67,200-1192	8175

7590 08/14/2006
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EXAMINER

KORNAKOV, MICHAEL

ART UNIT PAPER NUMBER

1746

DATE MAILED: 08/14/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/769,245

Applicant(s)

LU ET AL.

Examiner

Mikhail Kornakov

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 07 June 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 5, 8, 11-13, 15, 16 and 21-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5, 8, 11-13, 15, 16, 21-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 06/07/2006 has been entered.

2. Claims 1-3, 5, 8, 11-13, 15, 16, 21-30 are pending and examined on the merits.

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

4. Claims 1, 2, 5, 21-25 are rejected under 35 U.S.C. 102(e) as being anticipated by Korthius et al (US 2004/0074518).

Korthius discloses a method of cleaning semiconductor wafer having a metal, such as copper on the surface (0048, 0049), the process includes at least two CMP procedures, wherein after the first CMP process, the wafer is rinsed with surfactant (0047). By the virtue of surfactant action, the surface of the wafer inherently acquires hydrophilicity. A third CMP process may be performed, wherein the barrier layer comprising nitride (0050) is removed. Then the spraying of surfactant is performed, and the deionized water rinse is completed (0050). The method includes polishing of a surface of the semiconductor wafer that includes low-K dielectric material (0056).

5. Claims 3, 8, 11-13, 15, 16, and 26-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Korthius in view of Bessho et al (U.S. 6,440,856).

Korthius discloses the invention as claimed as discussed above. Korthius discloses the use of surfactant, however does not specifically provide for the presence of alcohol in the surfactant solution.

Bessho discloses a method for cleaning a wafer surface after the CPM (abstract), the wafer has a layer of dielectric, interlayer insulation and metallic wiring (col.11, lines 20-24). The process of Bessho includes the use of cleaning solution comprising surfactant, wherein the specific and preferred cleaning solution comprises alcohol, such as octanol (C8) (col.9, line 23), wherein the alcohol is used in the amounts of 0.01-5% by weight (col.10, lines 24, 25). Bessho also discloses the use of adducts of ethylene oxide in the cleaning composition comprising surfactant and alcohol (example 20 in col.16). Bessho emphasizes that the cleaning solution comprising surfactant can be used before and after CMP. Bessho emphasizes also that the use of alcohols is needed for imparting hydrophilicity to the surface to be cleaned. Therefore it would have been obvious to those skilled in the art to include the alcohol into surfactant solution of Korthius, since by the virtue of having OH groups capable of forming hydrogen bonding, such alcohol will impart the hydrophilicity to the wafer surface and thus increase the effectiveness of cleaning. The CMP process that includes polishing of copper, nitride, oxide or low-k material is discussed in the primary reference, as applied above.

Response to Arguments

6. Applicant's arguments filed 06/07/2006 have been fully considered but they are not persuasive. With regard to independent claim 1 Applicants submit that "...Korthius et al. only disclose rinsing the wafer with an undisclosed surfactant following the first copper polishing step and rinsing with BTA (to make hydrophobic) following the second copper polishing step and following the barrier layer polishing step". In response to this, it is noted that the sequence of steps as understood by Applicant and as cited from Applicants' response above is exactly the disclosure that perfectly reads on the instant claim 1: a) providing a surfactant solution (which simply means that such solution exists), b) subjecting the wafer to plurality of polishing steps; c) applying surfactant to the wafer after at least ONE of polishing steps; d) rinsing the surface.

7. With regard to the independent claim 13, the crux of Applicants arguments appears to hinge on rejection of Examiner's assertion of inherency in the teachings of Korthius et al. that by virtue of the surfactant action, the surface of the wafer inherently acquires hydrophilicity. Thus Applicants require the extrinsic evidence that the action of surfactant imparts hydrophilicity to the surface.

In response to this, please find an attachment of Google definitions of surfactant that involves the impart of wettability, wherein the wettability is nothing else but hydrophilicity by the virtue of its translation "hydro" -water "philos" - loving. Please, also find several US patens that clearly state the fact that the presence of surfactant in GENERAL and in particular referring to semiconductor substrates imparts hydrophilicity to the surface of

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being treated. US 5,693,037 (abstract), US 20050084681 (0018, 0024), US 6,677,251 US 20050170980 and KR 2002002747 A. Please note that the above references are NOT used for the present rejection, but SOLELY as an extrinsic evidence, since the Applicants challenged the Examiner's position on inherency.

8. Applicants also submit that Examiner is "... also mistaken that Korthius et al. teach rinsing with a surfactant following the barrier layer polishing step or a deionized water rinsing step" In response to this, it is noted that a third CMP process may be performed, wherein the barrier layer comprising nitride (0050) is removed. Then the spraying of surfactant is performed, and the deionized water rinse is completed (0050) according to Korthius.

9. This is an RCE of applicant's earlier Application No. 10/769,245. All claims are drawn to the same invention claimed in the earlier application and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the earlier application. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action in this case. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

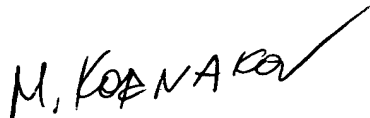
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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no, however, event will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mikhail Kornakov whose telephone number is (571) 272-1303. The examiner can normally be reached on 9:00 - 5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on (571) 272-1414. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

A handwritten signature in black ink, appearing to read "M. Kornakov", with a long, sweeping horizontal stroke extending to the right.

Mikhail Kornakov
Primary Examiner
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August 6, 2006